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NOTES ON THE BIOLOGY OF *CAENOCEPHUS ALDRICHI* BRADLEY (HYMENOPTERA: CEPHIDAE)

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Abstract.—The larva of *Caenocephus aldrichi* Bradley was found boring in stems of *Holodiscus discolor* (Pursh) (Rosaceae). This represents the first host plant record for the genus. The rarity of *C. aldrichi* is demonstrated by the finding of 12 infested stems in 30 hours of searching patches of *H. discolor*. In Oregon, *C. aldrichi* appears to be univoltine, with adults present from early May to early July. Observed mortality factors include parasitism by *Pteromalus* sp. (Hymenoptera: Pteromalidae) and possible predation by birds.

Key Words: *Caenocephus*, Cephidae, *Holodiscus*, host plant.

The host plants of stem sawflies (Hymenoptera: Cephidae) are fairly well known at the generic level. In North America there are six genera in the Cephidae, all in the Cephinae. Species with known hosts in the Cephini (*Calameuta*, 1 sp.; *Cephus*, 2 spp.; and *Trachelus*, 1 sp.) are stem borers in grasses as larvae. Species with known hosts in the Hartigiini (*Caenocephus*, 1 sp.; *Hartigia*, 6 spp.; and *Janus*, 4 spp.) may bore in the stems of various angiosperms (Smith 1979, 1986). Larvae of *Hartigia* species appear to be restricted to the Rosaceae (roses and blackberries) while species of *Janus* utilize various woody dicots (Hanson 1986, Middlekauff 1969). However, the host plant of *Caenocephus aldrichi* Bradley was heretofore unknown. The only other species in this genus is the Palearctic *C. lunulatus* (Strobl) and its host plant is also unknown (Schedl 1981).

Limited data are available on the biology of adults. The species has been recorded from British Columbia, Washington, Idaho, Oregon, and California (Bradley 1905, Middlekauff 1952, 1969), but specimens are very rare in collections (D. R. Smith, pers. comm.). The purpose of this paper is to report the discovery of the host plant of *C. aldrichi* and present brief notes on its biology.

MATERIALS AND METHODS

A search for the larval host plant was begun by limiting field observations to species of Rosaceae, Fagaceae, and Salicaceae where geographic distributions were within the recorded distribution of adult *C. aldrichi*. Because species in the closely related genus *Hartigia* are confined to Rosaceae, special attention was devoted to members of this family.

Field sampling was conducted by looking for severed stems for a set period of time that varied depending on plant density. Typically, several thousand stems were observed in an hour of searching. Stems with severed tips were clipped and set aside until the sampling period was over. The severed stems were then partially dissected to verify

the presence of an insect larva. The "occupied" stems were placed individually in glass tubes (20 cm × 2.5 cm) plugged with cotton. Tubes containing infested stems were kept outside for three months (November–January) and were then brought into the laboratory (22 ± 2°C) for observation of adult emergence.

When cephid larvae were discovered in stems of *Holodiscus discolor* (Pursh), additional field observations and collections were concentrated on this species. Infested stems were collected July–October of 1986 from the following localities in Oregon: Benton County (Corvallis and Mary's Peak); Curry County (15 miles east of Port Orford); and Wasco County (13–16 miles west of Dufur).

Adult stem sawflies, a larva, and parasitoids obtained from this study were deposited in the Systematic Entomology Laboratory, Department of Entomology, Oregon State University.

Results and Discussion

Adult cephids reared from stems of *H. discolor*, ocean spray, were identified as *C. aldrichi* using keys published by Middlekauff (1969) and comparison with specimens identified by D. R. Smith in the Oregon State University insect collection.

The number of infested shoots was extremely low at all sites where *C. aldrichi* were found. Several stands of *H. discolor* were searched for a total of 16 hours without yielding any infested stems. However, in Wasco County (13–16 miles west of Dufur), 8 infested stems were found after a total of 6 hours of searching. Only 4 infested stems were found at the other sites after 10 hours of searching. Thus, a total of 12 infested stems was found from all sites after 30 hours of searching. The difficulty in finding stems of *H. discolor* infested by *C. aldrichi* could be a result of not observing the primary host, which then would remain to be discovered. However, the relative abundance of infested stems at the Wasco Co. site suggests that the association of *C. aldrichi* with *H. discolor* is more than an incidental host record.

Species of Cephidae either sever the stem as an adult at the time of oviposition or as a larva when stem boring is initiated. The stems harboring larvae of *C. aldrichi* were severed in a manner which resulted in a line of girdling that was very smooth and without jagged marks. In comparison, the girdle line on severed shoots containing *Janus rufiventris* (Cresson), in which the adult female girdles the stem with her ovipositor, is rough and exhibits jagged marks around the circumference of the stem (Hanson 1986). In the absence of direct observations this suggests that in *C. aldrichi* the shoot is probably girdled by the larva.

Only the wider stems of *H. discolor* were infested. Stem width of all growing shoots ranged from 0.9 mm to 7.0 mm in diameter. Infested stems ranged from 2.8–7.00 mm in diameter when measured at mid-length of the infested portion.

The pattern of the tunnel in the stem illustrates the behavior of the larva. We noted patterns in tunnelling that suggest the following: the newly hatched larva after girdling the shoot tunnels toward the base in the cambial zone for a short distance (1–3 mm), the larva then turns back (upwards) to the girdled apex, tunnels to the midsection of the shoot, and then bores down the center toward the base of the stem. At the initiation of the downward tunnelling the larva is consuming almost the entire interior of the shoot and packing frass in the vacated tunnel.

Patterns in the length of infested stems suggested that a second severing of the shoot occurs. Stems collected in July had tunnels averaging 5 cm in length (severed apex to location of larval head), whereas stems collected in October had tunnels less than 1 cm in length (newly severed apex to the base of the prepupal chamber). These observations suggested that the last instar severs the stem again, before forming a pupal chamber. Thus, the portion of the stem contain-

ing the initial tunnelling falls off the plant. Similar behavior has been documented in other cephids (Middlekauff 1969).

Observations of emergence in the laboratory indicated that adults exit the shoot by chewing through the apical frass plug, rather than through the stem as in other Hartigiini.

We observed some larval-pupal mortality factors. A larva in one of the 12 infested stems contained larvae of a gregarious *Pteromalus* sp. (Hymenoptera: Pteromalidae; identification by P.E.H.). These parasitoid larvae were reared and produced six females and two males (on July 8) one week after collection. Two of the stems with tunnels had irregular holes in the region of the pupal chamber. The holes exhibited peeled edges and the chamber lacked a cephid larva, suggesting possible mortality by bird predation. In three of the infested stems the cephid larva had already died from unknown causes and in four of the infested stems larvae died after collection (one was preserved), probably because they were collected too early in the season. Thus, we obtained only two adults (both female) out of 12 infested stems.

Data from specimens in the Oregon State University insect collection indicate that adult *C. aldrichi* are active from early May at lower elevations in the Willamette Valley (about 100 m), to early July at higher elevations on Mary's Peak (about 1000 m). Our field observations on the state of larval development in the field indicated that this species is univoltine in Oregon.

The only other species presently placed in *Caenocephus* is the Palearctic *C. lunulatus* (Strobl), formerly known as *C. jakowleffi* Knonow (Schedl 1981). Because *Holodiscus* is absent from the Old World, the host plant of this species must be different from that of *C. aldrichi*.

With the discovery of a host plant containing the larva of *C. aldrichi*, it will be possible to compare the morphology of immature *Caenocephus* with that of other genera of Hartigiini. In a key to the larvae of Cephidae, Middleton (1917) noted that in *Hartigia* the lateral area of the basal anal lobe is setose, whereas in *Janus* this area is bare. In the single preserved specimen of *C. aldrichi* the lateral area of the basal anal lobe is setose as in *Hartigia*. Additional collections of larval *C. aldrichi* are needed for studies on variation in larval morphology.

Based on our limited observations of this rarely collected species it appears that *Caenocephus* is more similar to *Hartigia* than to *Janus*. The following observations suggest this relationship: host plant is in the Rosaceae, initial stem-girdling is likely performed by the larva, and the basal anal lobe is setose in the larva.

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